DOCUMENT RESUME

ED 153 815 SE 024 049

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TITLE A Review of Literature Published in 1973 on Mathematics Education in the Community Junior College.
PUB DATE [78]
NOTE 15p.; Contains occasional broken type

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Algebra; Analytic Geometry; Annotated Bibliographies; Calculus; *College Mathematics; *Community Colleges; Instruction; *Junior Colleges; *Literature Reviews; *Mathematics Education; Mathematics Teachers

ABSTRACT

Twenty-eight reports, articles, and papers published in 1973 which concern mathematics education in the community junior college are reviewed. Much of this literature was found in "The Two-Year College Mathematics Journal," "The American Mathematical Monthly," or among Educational Resources Information Center (ERIC) reports. The references are listed by seven categories: (1) the teaching of remedial arithmetic, (2) the teaching of elementary algebra, (3) the teaching of business math, (4) the teaching of analytic geometry and calculus, (5) modes of instruction, (6) two-year college mathematics teachers, and (7) general evaluation and interest. Some of the references appear under more than one of these categories. In each category, the references are numbered and refer to the numbered bibliography at the end of the compilation. (MN)

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# A REVIEW OF LITERATURE

# PUBLISHED IN 1973 ON

# MATHEMATICS EDUCATION IN THE COMMUNITY JUNIOR COLLEGE

by

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The following is a review of the literature published in 1973 on mathematics education in the community junior colleges.* Many sources of literature were consulted; the most fruitful of these sources were The Two-Year College Mathematics Journal, the American Mathematical Monthly and the Educational Resources Information Center (ERIC) reports. The ERIC reports were most frequently dissertation reports. Committee on Undergraduate Program in Mathematics (CUPM) materials were reviewed but all materials dealing with mathematics education in two-year colleges were dated prior to 1973. In many cases the conclusions of an article or a report are stated; this is done with the caveat that these conclusions are best understood after reading the original article or report.

After a perusal of the literature, seven catagories of classification were selected: The teaching of remedial arithmetic, the teaching of elementary algebra, the teaching of business math, the teaching of analytic geometry and calculus, modes of instruction, two-year college mathematics teachers, and general evaluation and interest. Some of the references appear under more than one of these categories. In each catagory the references are numbered and refer to the numbered bibliography at the end of this compilation.

* For a review of leterature in mathematics education in community/ junior colleges for the period prior to 1973 see "A Bibliography of Literature: Mathematics Education in the Junior and Community Colleges," The Two Year College Mathematics Journal, vol. 5, No. 1 Winter 1974, pp. 53-59.

I. The Teaching of Remedial Arithmetic

13. Medin, The Teaching of Developmental Mathematics in Community Colleges.

This report reviews remedial mathematics programs in the Washington D.C. and Maryland areas. It also reviews research and studies of remedial programs at the community college level in other parts of the United States.

16. Peck and Jencks, "Providing Advantage to the Disadvantaged."

This article describes a mathematics program at the University of Utah for disadvantaged students. A disadvantaged student is define as a student whose predicted grades for the University are C- or lower. Rather than ask the students to repeat a traditional remedial math program, students are challenged and motivated by a new set of problems rich in patterns and internal logic. Specific examples of such problems are discussed in the article.

19. Randall, The Effectiveness of Remedial Arithmetic Courses in Three Selected California Community Colleges as Measured by Improvement in Arithmetic Skills and Attitudes Toward Mathematics.

The title of this report is self-explanatory. In addition, two methods of teaching remedial arithmetic are compared. It was found that although both programmed instruction and the traditional lecture method produced significant improvement in arithmetic skills, the lecture method led to a significant improvement in attitude.

II. The Teaching of Elementary Algebra

5. Conroy, The Effects of Age and Sex Upon Programmed Instruction in Remedial Algebra I at Northern Virginia Community College.

This report indicates that older students achieve significantly better than younger students in remedial algebra I. The variables of sex and instructional method (programmed vs. conventional) were not found to be related to significant differences in achievement.

7. Eisenberg and Browne, "Using Student-Tutors in Precalculus Instruction."

This paper discusses the use of undergraduate students from a secondary education math-methods class as recitation tutors for students enrolled in an elementary algebra course (M100) at Northern Michigan University. After switching from a large lecture format to a lecture recitation format, the failure rate in Math 100 dropped by one-half and the average performance on tests improved by 10%. Students and faculty members attributed these results to the change in classroom format. No formal evaluation comparing the two formats was conducted.

14. Merritt, The Effects of Variations in Instruction and Final Unit Evaluation Procedures on Community College Beginning Algebra Classes.

This report compares classroom organization (small group vs. large group) and student evaluation procedures (two tests vs. one test) as measured by mathematics achievement, attitude toward mathematics, test anxiety and the dropout-failure rate. Of the differences examined the only significant difference obtained was in favor of achievement of the "two-test group" over the "one-test group".

15. Morman, "An Audio-Tutorial Method of Instruction vs. the Traditional Lecture-Discussion Method."

The title of this study is self-explanatory. The students used in this study were enrolled in remedial algebra at San Jacinto College in Pasadeno, Texas. It was found that the achievement level and the attrition rates between the two groups did not vary significantly ($p<.05$).

III. The Teaching of Business Math

12. Macbeth and Dery, "Key Concept Mathematics and Management Science Models."

This article describes a 1-2 semester business math program taught through the use of models. Arguments are given for the deletion and for the inclusion of mathematical topics based on their value to business. The authors maintain that such a business math program would fit nicely into a junior college program and would reduce the problem of credit transfer.

20. Randles and Schaeffer, "An Integrated Sequence in the Mathematical Sciences for the Undergraduate Business Students."

This article describes an integrated program of mathematics, statistics and computer programming for business students which has been developed at the University of Iowa. The course structure and the integrated course topics are briefly discussed.

26. Waits, "Individual Instruction in Large Enrollment Mathematics Courses."

Reviewed in catagory IV.

IV. The Teaching of Analytic Geometry and Calculus

2. Bender, "Teaching Applicable Mathematics."

This author proposes a model approach for the teaching of the first two years of calculus. The models are intended to provide the motivation for the learning of applicable mathematics. Such a calculus course necessarily draws material from other areas of mathematics (i.e. differential equations and probability theory) and may not cover certain topics usually a part of the standard calculus course.

4. Clark, "Some Socially Relevant Applications of Elementary Calculus."

This article contains some excellent examples of how calculus can be used to understand current social problems. After most of the examples, problems are listed which could be assigned to the students.

6. Douthitt, "The Effects of a Laboratory on Achievement in College Freshman Mathematics."

This article summarizes the results of a research project conducted with freshman who registered for analytic geometry at the University of Houston. The study compared two instructional methods: expository with a mathematics laboratory and expository with no mathematics laboratory. The treatment and control groups were also divided into subgroups of risk and nonrisk students. One of the main conclusions drawn as a result of this study was that a significantly higher percent of risk students can do acceptable work in mathematics when they are given encouragement and motivation through a mathematics laboratory.

26. Waits, "Individualized Instruction in Large Enrollment Mathematics Courses."

This article reports on the progress of a program at Onio State University to individualize two introductory calculus sequences:

Calculus for the Business Students and Calculus for Engineering and Physical Science Students. Ageneral description of the program is given as well as a discussion of the difficulties encountered. Additional information is available upon request.

V. Modes of Instruction

2. Bender, "Teaching Applicable Mathematics."
Reviewed in category IV.

3. Buzard, "Modular System at Kendall."
This article explains briefly why Kendall College, a two-year private liberal arts college in Evanston, Illinois, has modularized such mathematics courses as arithmetic, algebra, calculus and linear algebra. The main reasons given were: meeting the students at their level and using the students' most efficiently to learn what they don't know.

5. Conroy, The Effects of Age and Sex Upon a Comparison Between Achievement Gains in Programmed Instruction in Remedial Algebra I at Northern Virginia Community College.
Reviewed in category IV.

6. Douthitt, "The Effects of a Laboratory on Achievement in College Freshman Mathematics."
Reviewed in category IV.

7. Eisenberg and Browne, "Using Student-Tutors in Precalculus Instruction."
Reviewed in category II.

8. Giangrasso, "A Flexible Response to Open Admissions."
This article describes a mathematics program at Staten Island Community College. The mathematics program described includes

a semester of preparatory mathematics and a semester of pre-calculus mathematics. Both semesters are modularized. The article discusses placement of the student in the proper module, the content covered in each module and variation of the modules to meet the needs of students in special programs such as liberal arts, business and nursing.

9. Ham, "The Lecture Method in Mathematics."
Many valid criticisms of the lecture method as it is commonly employed are discussed in this article. It contains some good suggestions for the improvement of college mathematics instruction.

14. Merritt, The Effects of Variations in Instruction and Final Unit Evaluation Procedures on Community College Beginning Algebra Classes.
Reviewed in category II.

16. Pecks and Jencks, "Providing Advantage to the Disadvantaged."
Reviewed in category I.

19. Randall, The Effectiveness of Remedial Arithmetic Courses in Three Selected California Community Colleges as Measured by Improvement in Arithmetic Skills and Attitudes toward Mathematics.
Reviewed in category I.

22. Siner, "A Responsive Mathematics Program for Open Admissions."
This is a report on the development of the mathematics program at Staten Island Community College, one of the two-year community colleges of the City University of New York. Students are placed according to their backgrounds and their scores on a mathematics examination. The approach is modular and students are allowed to progress at their own pace. Student criticisms, faculty reactions and program revisions are also discussed.

23 Spangler, "Lower Columbia College Mathematics Learning Center."

The learning of arithmetic, elementary algebra and intermediate algebra through a mathematics learning center is discussed in this article. The students use a programmed text and progress at their own speed. A qualified instructor is available to assist students at the mathematics learning center. The student must pass a certain number of unit exams to receive credit for each course. The specifics on the implementation of this program at Tacoma Community College, Tacoma, Washington and the advantages and disadvantages are discussed.

25. Wagoner and Jones, "Group-Based Instruction: The Best Chance for Success?"

This article reviews many studies comparing the achievement level of students and the time spent in course completion. The authors suggest that a greater proportion of students in community college mathematics courses would succeed if a policy of mastery learning and flexible time scheduling were adopted.

26. Waits, "Individualized Instruction in Large Enrollment Mathematics Courses."

Reviewed in category IV.

28. Williams, "The Mathematics Laboratory and the Single Student."

This is an excellent article on the use of the mathematics laboratory as an instructional mode. It also discusses many of the problems associated with the development and operation of such a mathematics laboratory.

VI. Two-Year College Mathematics Teachers

10. Larney, "Female Mathematicians, Where Are You?"

This article deals with the problem of finding qualified women

mathematicians to teach in two and four year colleges. Women earning Ph.D.'s in mathematics were only 7.1% of the total number of people earning Ph.D.'s in mathematics from 1931-1970. Women earning master's degrees in mathematics were only 22.2% of the total number of people earning master's degrees in mathematics from 1951-1970. The conclusion is made that a small community college with a mathematics faculty of four men and one woman has its share of the national supply of qualified females.

11. Lindstrom, "Survival of the Two-Year College Mathematics Teacher." This article suggests ways in which the two-year college mathematics teachers can upgrade themselves professionally and ways in which they can benefit as an active member of the M.A.A. The tone of the article is somewhat critical of present two-year college mathematics teachers.

17. Perry, "A Study Using CUPM Recommendations As criteria, of the Academic Preparation of Two-Year College Teachers."
This is an extremely interesting article. It indicates what mathematics courses have been taken by the average two-year college mathematics teacher as compared to those courses recommended by CUPM.

18. Price, "A Doctorate for the Two-Year College Instructor."
This article deals with the shortcomings of most Ph.D. programs in mathematics to prepare excellent college mathematics instructors. This author urges the mathematics departments of our universities to develop a Ph.D program aimed at the teaching of collegiate mathematics. But until universities create such

a program, he views the Ph.D. in mathematics education as the most appropriate degree program for a college mathematics teacher.

VII. General Evaluation and Interest

1. Behr, "Achievement, Aptitude and Attitude in Mathematics."
This study investigates the relationships between achievement, aptitude, and attitude in mathematics for first year liberal arts students at Queensborough Community College in New York. The results of this study show that the relationships between achievement, aptitude, and attitude are not the same for both sexes and that different predictive equations for achievement in mathematics should be established for men and women.

21. Robertson, "Another Challenge in the Classroom."
This article presents mathematics as a human endeavor. It is one mathematician's response to the prevalent student opinion that mathematics is too rigid and mechanical.

24. Stein, "Mathematics for the Captured Student."
This article discusses four aspects associated with teaching mathematics to "captured" students -- students who for some reason are required to take mathematics. These four aspects are correct student placement, proper content, methods of communication, and evaluation.

27. Waits and Elbrink, "Student Evaluation of Mathematics Instruction."
This research report examines the relationship between student evaluation and student achievement in sixteen sections of a non-majors calculus class at Ohio State University. The instruments used in this research study and the statistical

analysis are included in the report. Unfortunately, the statistical findings were inconclusive.

## BIBLIOGRAPHY


1. Behr, Anthony N., "Achievement, Aptitude and Attitude in Mathematics, The Two-Year College Mathematics Journal, Vol. 4, No. 2 (Spring 1973).

2. Bender, E. A., "Teaching Applicable Mathematics," The American Mathematical Monthly, Vol. 80, No. 3,(March 1973).

3. Buzard, Mary, "Modular System at Kendall...", Community and Junior College Journal, Vol. 43, No. 9, (June/July 1973).

4. Clark, Codin, "Some Socially Relevant Applications of Elementary Calculus," The Two-Year College Mathematics Journal, Vol. 4, No. 2, (Spring 1973).

5. Conroy, David E., The Effects of Age and Sex Upon a Comparison Between Achievement Gains in Programmed Instruction in Remedial Algebra I at Northern Virginia Community College, ERIC Report #078640, (1973).

6. Douthitt, Cameron, "The Effects of a Labor on Achievement in College Freshman Mathematics," The Two-year College Mathematics Journal, Vol. 4, No. 1, (Winter 1973).

7. Eisenberg, T.A., and Browne, J.B., "Using Student Tutors in Precalculus Instruction", The American Mathematical Monthly, Vol. 80, No. 6, (June/July 1973).

8. Giangrasso, Anthony, "A Flexible Response to Open Admissions," The Two-Year College Mathematics Journal, Vol. 4, No. 2, (Spring 1973).

9. Mam, M.W., "The Lecture Method in Mathematics: A Student's View, The American Mathematical Monthly, Vol. 80, No. 2, (February 1973).

10. Larney, Violet H., "Female Mathematicians, Where are You?", The American Mathematical Monthly, Vol. 80, No. 3, (March 1973).

11. Lindstrom, P.A., "Survival of the Two-year College Mathematics Teacher," The American Mathematical Monthly, Vol. 80, No. 10, (December 1973).

12. Macbeth, Thomas G. and Dery, George C., "Key Concept Mathematics and Management Science Models," Improving College and University Teaching, Vol. 21, No. 4, (Autumn 1973).

13. Medin, Julie, The Teaching of Developmental Mathematics in Community Colleges, ERIC Report #075 197 (1973).

14. Merritt, Paul William, The Effects of Variations in Instruction and Final Unit Evaluation Procedures on Community College Beginning Algebra Classes, ERIC Report #079082 (1973).

15. Morman, Shelba Jean, "An Audio Tutorial Method of Instruction vs. The Traditional Lecture-Discussion Method," The Two-year College Mathematics Journal, Vol. 4, No. 3, (Fall 1973).

16. Pick, Donald M. and Jencks, Stanley M., "Providing Advantage to the Disadvantaged," The Mathematics Teacher, Vol. 66, No. 5 (May 1973).

17. Perry, Donald, "A Study, Using CUPM Recommendations as Criteria, of the Academic Preparation of Two-year College Teachers," The Two-year College Mathematics Journal, Vol. 4, No. 2 (Spring 1973).

18. Price, H. Vernon, "A Doctorate for the Two-year College Instructor," The Two-year College Mathematics Journal, Vol. 4, No. 1, (Winter 1973).

19. Randall, John Douglas, The Effectiveness of Remedial Arithmetic Courses in Three Selected California Community Colleges as Measured by Improvement in Arithmetic Skills and Attitudes Toward Mathematics, ERIC Report #079 052 (1973).

20. Randles, R. H. and Schaeffer, A.J., "An Integrated Sequence in the Mathematical Sciences for the Undergraduate Business Students," The American Mathematical Monthly, Vol. 80, No. 4, (April 1973).

21. Robertson, Jack M., "Another Challenge in the Classroom," The Two-year College Mathematics Journal, Vol. 4, No. 2 (Spring 1973).

22. Siner, Helen B., "A Responsive Mathematics Program for Open Admissions," The Mathematics Teacher, Vol. 66, No. 6 (Oct. 1973).

23. Spangler, Richard, "Lower Columbia College Mathematics Learning Center," The Mathematics Teacher, Vol. 66, No. 5 (May 1973).

24. Stein, S.K., "Mathematics for the Captured Student," The Two-year College Mathematics Journal, Vol. 4, No. 3 (Fall 1973).

25. Wagoner, John and Jones, Howard, "Group-Based Instruction: The Best Chance for Success?" The Two-Year College Mathematics Journal, Vol. 4, No. 1 (Winter 1973).

26. Waits, Bert, "Individualized Instruction in Large Enrollment Mathematics Courses," The American Mathematical Monthly, Vol 80, No. 3 (March 1973).

27. Waits, Bert K. and Elbrink, Larry C., "Student Evaluation of Mathematics Instruction," The Two-Year College Mathematics Journal, Vol. 4, No. 2 (Spring 1973).

28. Williams, Ralph C., "The Mathematics Laboratory and the Single Student," The Two-Year College Mathematics Journal, Vol. 4, No. 1 (Winter 1973).